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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant: Munehiro TABATA et al.

Title: SULFUR POISONING ELIMINATION OF DIESEL ENGINE CATALYST

Appl. No.: 10/713,355

Filing Date: 11/17/2003

Examiner: Tu M. Nguyen

Art Unit: 3748

Confirmation Number: 9164

BRIEF ON APPEAL

Mail Stop Appeal Brief - Patents
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Sir:

Under the provisions of 37 C.F.R. § 41.37, this Appeal Brief is being filed together with a credit card payment form in the amount of $510.00 covering the 37 C.F.R. 41.20(b)(2) appeal fee. If this fee is deemed to be insufficient, authorization is hereby given to charge any deficiency (or credit any balance) to the undersigned deposit account 19-0741.

1. REAL PARTY IN INTEREST

The real party in interest is the assignee of record, NISSAN MOTOR CO., LTD.

2. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

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3. STATUS OF CLAIMS

Claims 1-14 are cancelled. Claims 15-29 are pending in the application. Claims 15-29 are rejected and are the subject of this appeal.

4. STATUS OF AMENDMENTS

The present application is under a final rejection (See Final Rejection mailed April 17, 2008). Appeal of claims 15-29 is appropriate because all of the claims have been twice rejected. See 35 U.S.C. § 134(a). There are no amendments after final rejection.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The invention of independent claim 15 is directed to a purification device (device 1 in FIG. 1) for an exhaust gas of a diesel engine (diesel engine 40 in FIG. 1), the diesel engine comprising a catalyst (NOx trap catalyst 10 in FIG. 1; specification, paragraph [0020]) which traps nitrogen oxides in the exhaust gas but decreases a nitrogen oxides trapping performance when poisoned by sulfur oxides in the exhaust gas, and a filter (diesel particulate filter 20 in FIG. 1) which traps particulate matter in the exhaust gas. The device comprises: a programmable controller (controller 50 in FIG. 1) programmed to: determine if an elimination of the sulfur oxides poisoning the catalyst is required (step S1 in FIG. 2; specification, paragraph [0037]); perform a process of eliminating the sulfur oxides poisoning the catalyst, when elimination of the sulfur oxides poisoning the catalyst has been determined to be required (step S2 in FIG. 2; specification, paragraphs [0038] and [0039]); determine if a regeneration of the filter is required while performing the process of eliminating the sulfur oxides (step S3 in FIG. 2; specification, paragraph [0046]); perform the regeneration of the filter while interrupting the process of eliminating the sulfur oxides, when the regeneration of the filter has been determined to be required (step S4 in FIG. 2; specification, paragraph [0052]); determine during the regeneration of the filter if a residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns (specification, paragraphs [0063] and [0064]); and stop the

regeneration of the filter and resume the process of eliminating the sulfur oxides poisoning the catalyst, when the residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns (step S5 in FIG. 2; specification, paragraphs [0063], [0064], [0066]).

The invention of independent claim 27 is directed to a purification device (device 1 in FIG. 1) for an exhaust gas of a diesel engine (diesel engine 40 in FIG. 1), the diesel engine comprising a catalyst (NOx trap catalyst 10 in FIG. 1; specification, paragraph [0020]) which traps nitrogen oxides in the exhaust gas but decreases a nitrogen oxides trapping performance when poisoned by sulfur oxides in the exhaust gas, and a filter (diesel particulate filter 20 in FIG. 1) which traps particulate matter in the exhaust gas. The device comprises: means for determining if an elimination of the sulfur oxides poisoning the catalyst is required (controller 50 in FIG. 1, step S1 in FIG. 2; specification, paragraph [0037]); means for performing a process of eliminating the sulfur oxides poisoning the catalyst, when the elimination of the sulfur oxides poisoning the catalyst has been determined to be required (controller 50 in FIG. 1, step S2 in FIG. 2; specification, paragraphs [0038] and [0039]); means for determining if a regeneration of the filter is required while performing the process of eliminating the sulfur oxides (controller 50 in FIG. 1, step S3 in FIG. 2; specification, paragraph [0046]); means for performing the regeneration of the filter while interrupting the process of eliminating the sulfur oxides, when the regeneration of the filter has been determined to be required (controller 50 in FIG. 1, step S4 in FIG. 2; specification, paragraph [0052]); means for determining during the regeneration of the filter if a residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns (controller 50 in FIG. 1, specification, paragraphs [0063] and [0064]); and means for stopping the regeneration of the filter and resuming the process of eliminating the sulfur oxides poisoning the catalyst, when the residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns (controller 50 in FIG. 1, step S5 in FIG. 2; specification, paragraphs [0063], [0064], [0066]).

The invention of independent claim 28 is directed to a purification method for an exhaust gas of a diesel engine (diesel engine 40 in FIG. 1), the diesel engine comprising a catalyst (NOx trap catalyst 10 in FIG. 1; specification, paragraph [0020]) which traps nitrogen oxides in the exhaust gas but decreases a nitrogen oxides trapping performance when poisoned by sulfur oxides in the exhaust gas, and a filter (diesel particulate filter 20 in FIG. 1) which traps particulate matter in the exhaust gas. The method comprises: determining if an elimination of the sulfur oxides poisoning the catalyst is required (step S1 in FIG. 2; specification, paragraph [0037]); performing a process of eliminating the sulfur oxides poisoning the catalyst, when the elimination of the sulfur oxides poisoning the catalyst has been determined to be required (step S2 in FIG. 2; specification, paragraphs [0038] and [0039]); determining if a regeneration of the filter is required while performing the process of eliminating of the sulfur oxides (step S3 in FIG. 2; specification, paragraph [0046]); performing the regeneration of the filter while interrupting the process of eliminating the sulfur oxides, when the regeneration of the filter has been determined to be required (step S4 in FIG. 2; specification, paragraph [0052]); determining during the regeneration of the filter if a residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns (specification, paragraphs [0063] and [0064]); and stopping the regeneration of the filter and resuming the process of eliminating the sulfur oxides poisoning the catalyst, when the residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns (step S5 in FIG. 2; specification, paragraphs [0063], [0064], [0066]).

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed on appeal are:

A. the rejection of claims 15, 16, 24 and 27-29 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Published Patent Application 2003/0113249 to Hepburn et al. ("Hepburn") in view of U.S. Patent No. 6,574,956 to Moraal et al. ("Moraal");

B. the rejection of claims 17 and 26 under 35 U.S.C. § 103(a) as being unpatentable over Hepburn in view of Moraal, and further in view of U.S. Patent No. 6,938,411 to Hoffmann et al. ("Hoffmann");

C. the rejection of claims 20-23 under 35 U.S.C. § 103(a) as being unpatentable over Hepburn in view of Moraal, and further in view of U.S. Patent No. 6,594,990 to Kuenstler et al. ("Kuenstler"); and

D. the rejection of claims 18-19 and 25 under § 103(a) as being unpatentable over Hepburn in view of Moraal, and further in view of legal precedent.

7. ARGUMENT

A. The rejection of claims 15, 16, 24 and 27-29 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Published Patent Application 2003/0113249 to Hepburn et al. ("Hepburn") in view of U.S. Patent No. 6,574,956 to Moraal et al. ("Moraal").

The device of independent claim 15 recites:

> A purification device for an exhaust gas of a diesel engine, the diesel engine comprising a catalyst which traps nitrogen oxides in the exhaust gas but decreases a nitrogen oxides trapping performance when poisoned by sulfur oxides in the exhaust gas, and a filter which traps particulate matter in the exhaust gas, the device comprising:
>
> a programmable controller programmed to:
>
> determine if an elimination of the sulfur oxides poisoning the catalyst is required;
>
> perform a process of eliminating the sulfur oxides poisoning the catalyst, when elimination of the sulfur oxides poisoning the catalyst has been determined to be required;
>
> *determine if a regeneration of the filter is required while performing the process of eliminating the sulfur oxides*;
>
> perform the regeneration of the filter while interrupting the process of eliminating the sulfur oxides, when the regeneration of the filter has been determined to be required;

determine during the regeneration of the filter if a residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns; and

stop the regeneration of the filter and resume the process of eliminating the sulfur oxides poisoning the catalyst, when the residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns.

Hepburn fails to disclose at least the above italicized feature of claim 15 in the context of that claim.

Hepburn discloses a routine in FIG. 4C for purging both SOx (sulfur oxide) and particulate matter from a filter 19. Hepburn discloses a total time and intermediate time for removing SOx from the filter 19 as DSOXTIME and DSOX-CNT_PRD, respectively, and a total time and intermediate time for purging particulate matter as DPMTIME_MAX and DPMCNT_PRD, respectively (See paragraphs [0058], [0062] and [0076]). In step 274 of the routine in FIG. 4C, it is determined if the value DSOXCNT is greater than or equal to the intermediate time DSOX-CNT_PRD. When the determination in step 274 is affirmative, the total time DSOXTIME for SOx purging is incremented in step 276, and the fuel flow rate F1 is set equal to zero in step 278 to create a lean mixture of exhaust gases for removing particulate matter from filter 19 (paragraph [0081]). In step 280, the value DPMCNT is incremented (paragraph [0084]). In step 282, a determination is made as to whether DPMCNT is greater than or equal to regeneration period DPMCNT_PRD. If the determination in step 282 is "Yes", the method advances to step 284 to terminate the particulate matter removal process (FIG. 4C).

Hepburn, however, does not disclose as recited in claim 15, a programmable controller programmed to "determine if a regeneration of the filter is required while performing the process of eliminating the sulfur oxides." Rather, Hepburn merely discloses stopping its intermediate SOx purge and performing particulate matter removal based on the value DSOXCNT being greater than or equal to the intermediate time DSOX-CNT_PRD (See step 274). The values DSOXCNT and DSOX-CNT_PRD are values relating to the SOx purge time, and do not represent a determination that particulate matter regeneration of the particulate matter filter is required. The value DSOXCNT used in the determination in step

274 is a counter representing a duration of removal of sulfur oxides as can be understood from paragraph [0079]. The value DPMCNT used in the determination in step 282 is a counter representing a duration of removal of particulate matter as can be understood from paragraph [0084]. The routine of Hepburn in FIG. 4c, therefore, discloses starting removal of particulate matter from the filter when SOx elimination has been performed for a predetermined time period DSOXCNT_PRD and terminating removal of particulate matter when it has been performed for a predetermined time period DPMCNT_PRD. The routine of Hepburn continues to perform elimination of sulfur oxides until the determination in step 274 turns to be affirmative, irrespective of the necessity of removal of particulate matter. Thus, Hepburn does not disclose determining if the regeneration of its particulate matter filter is required while performing the process of eliminating the sulfur oxides, as recited in claim 15, and claim 15 is patentable thereover for at least this reason.

The Patent Office states on page 9 of the Final Office Action:

> The examiner has concluded that in step 274, Hepburn et al. determine if a regeneration of the catalyst to remove particulate matter is required while performing a process of eliminating SOx. Thus, in a broad reasonable interpretation of the claim language, Hepburn et al. indeed disclose or teach the claimed limitation in dispute.

Applicants respectfully disagree. Interpreting step 274 of Hepburn as disclosing determining if the regeneration of its particulate matter filter is required while performing the process of eliminating the sulfur oxides would not be a reasonable interpretation to one skilled in the art. Hepburn discloses in step 222 of FIG. 4A determining whether the accumulated particulate matter, CUMPM1, for filter 19 is greater than a predetermined maximum amount, CUMPM1_MAX, of particulate matter (See FIG. 4A, paragraphs [0054] and [0057]). If the accumulated particulate matter is greater than the predetermined maximum amount of particulate matter, then the particulate matter regeneration routine, PMREG1, is performed (See paragraph [0057]). When the cumulative amount of SOx, CUMSOX1, is also greater than a maximum value CUMSOX1_MAX, the routine SOXREG1-PMREG1 is executed to purge both SOx and particulate matter (paragraph [0063]). Thus, the determination of whether regeneration of the particulate matter filter is

required is performed at step 222 in FIG. 4A, before performing the routine SOXREG1-PMREG1 in FIG. 4C to purge both SOx and particulate matter. The step 274 of the routine SOXREG1-PMREG1 is performed after it has already been determined in step 222 that regeneration of the particulate matter filter is required. Step 274 in Hepburn merely determines whether the intermediate time DSOX_CNT-PRD has been reached, so that the sulfur oxide elimination process can be suspended before beginning an intermediate particulate matter removal step. By the time step 274 has been reached, it has already been long determined in step 222 that the regeneration of the particulate matter filter is required, and one of ordinary skill in the art would have reasonably interpreted Hepburn as not disclosing the method of claim 15.

Moraal was cited for other features of the claims, but fails to cure the deficiencies of Hepburn with respect to the feature in claim 15 of a programmable controller programmed to determine if a regeneration of the filter is required while performing the process of eliminating the sulfur oxides.

Independent claims 27 and 28 respectively recite "means for determining if a regeneration of the filter is required while performing the process of eliminating the sulfur oxides" and "determining if a regeneration of the filter is required while performing the process of eliminating of the sulfur oxides", and are patentable over Hepburn for reasons analogous to claim 15.

The dependent claims 16, 24 and 29 are patentable for at least the same reasons as claim 15, from which they depend either directly or indirectly, as well as for further patentable features recited therein.

B. The rejection of claims 17 and 26 under 35 U.S.C. § 103(a) as being unpatentable over Hepburn in view of Moraal, and further in view of U.S. Patent No. 6,938,411 to Hoffmann et al. ("Hoffmann").

Dependent claims 17 and 26 ultimately depend from independent claim 15. As discussed above, Hepburn and Moraal fail to disclose as recited in claim 15 a programmable controller programmed to determine if a regeneration of the filter is required while performing the process of eliminating the sulfur oxides. Hoffmann was cited for disclosing other features of claims 17 and 26, but fails to cure the deficiencies of Hepburn and Moraal. Thus, claims 17 and 26 are patentable for at least the same reasons as independent claim 15.

C. The rejection of claims 20-23 under 35 U.S.C. § 103(a) as being unpatentable over Hepburn in view of Moraal, and further in view of U.S. Patent No. 6,594,990 to Kuenstler et al. ("Kuenstler").

Dependent claims 20-23 ultimately depend from independent claim 15. As discussed above, Hepburn and Moraal fail to disclose as recited in claim 15 a programmable controller programmed to determine if a regeneration of the filter is required while performing the process of eliminating the sulfur oxides. Kuenstler was cited for disclosing other features of claims 20-23, but fails to cure the deficiencies of Hepburn and Moraal. Thus, claims 20-23 are patentable for at least the same reasons as independent claim 15.

D. The rejection of claims 18-19 and 25 under § 103(a) as being unpatentable over Hepburn in view of Moraal, and further in view of legal precedent.

Dependent claims 18-19 and 25 ultimately depend from independent claim 15. As discussed above, Hepburn and Moraal fail to a disclose as recited in claim 15 a programmable controller programmed to determine if a regeneration of the filter is required while performing the process of eliminating the sulfur oxides. Thus, claims 18-19 and 25 are patentable for at least the same reasons as independent claim 15.

8. CONCLUSION

For the foregoing reasons, it is submitted that the PTO's rejections are erroneous, and reversal of the applied rejections is respectfully requested.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Appellants hereby petition for such extension under 37 C.F.R. §1.136 and authorize payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date September 26, 2008

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9. CLAIMS APPENDIX

1 -14. (Cancelled).

15. (Previously Presented) A purification device for an exhaust gas of a diesel engine, the diesel engine comprising a catalyst which traps nitrogen oxides in the exhaust gas but decreases a nitrogen oxides trapping performance when poisoned by sulfur oxides in the exhaust gas, and a filter which traps particulate matter in the exhaust gas, the device comprising:

a programmable controller programmed to:

determine if an elimination of the sulfur oxides poisoning the catalyst is required;

perform a process of eliminating the sulfur oxides poisoning the catalyst, when elimination of the sulfur oxides poisoning the catalyst has been determined to be required;

determine if a regeneration of the filter is required while performing the process of eliminating the sulfur oxides;

perform the regeneration of the filter while interrupting the process of eliminating the sulfur oxides, when the regeneration of the filter has been determined to be required;

determine during the regeneration of the filter if a residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns; and

stop the regeneration of the filter and resume the process of eliminating the sulfur oxides poisoning the catalyst, when the residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns.

16. (Previously Presented) The purification device as defined in Claim 15, wherein the process of eliminating the sulfur oxides poisoning the catalyst is performed by causing the catalyst to contact with an exhaust gas corresponding to a rich air-fuel ratio, and the regeneration of the filter is performed by burning a trapped particulate matter by causing the filter to contact with an exhaust gas corresponding to a lean air-fuel ratio.

17. (Previously Presented) The purification device as defined in Claim 16, further comprising a sensor which detects a differential pressure between an inlet and an outlet of the filter, and the controller is further programmed to determine if the regeneration of the filter is required based on the differential pressure.

18. (Previously Presented) The purification device as defined in Claim 16, wherein the exhaust gas corresponding to the rich air-fuel ratio corresponds to an exhaust gas produced by combustion of an air-fuel mixture wherein an excess air factor is within the range 0.95 to 1.0.

19. (Previously Presented) The purification device as defined in Claim 16, wherein the exhaust gas corresponding to the lean air-fuel ratio, corresponds to an exhaust gas produced by combustion of an air-fuel mixture wherein an excess air factor is within the range 1.05 to 1.1.

20. (Previously Presented) The purification device as defined in Claim 16, further comprising an intake throttle which regulates an intake air amount of the engine, and the controller is further programmed to generate the exhaust gas corresponding to the rich air-fuel ratio and the exhaust gas corresponding to the lean air-fuel ratio through control of the intake throttle.

21. (Previously Presented) The purification device as defined in Claim 16, further comprising a fuel injector which injects fuel into the exhaust gas of the engine, and the controller is further programmed to generate the exhaust gas corresponding to the rich air-fuel ratio and the exhaust gas corresponding to the lean air-fuel ratio through control of a fuel injection amount of the fuel injector.

22. (Previously Presented) The purification device as defined in Claim 16, wherein the engine comprises an exhaust gas recirculation passage which recirculates part of the exhaust gas into an intake air according to an exhaust gas pressure of the engine, the purification device further comprises an exhaust throttle which regulates the exhaust gas pressure, and the

controller is further programmed to generate the exhaust gas corresponding to the rich air-fuel ratio and the exhaust gas corresponding to the lean air-fuel ratio through control of the exhaust throttle.

23. (Previously Presented) The purification device as defined in Claim 16, further comprising a fuel injector which supplies fuel for combustion, and the controller is further programmed to generate the exhaust gas corresponding to the rich air-fuel ratio and the exhaust gas corresponding to the lean air-fuel ratio through control of a post-injection by the fuel injector after fuel is supplied for combustion.

24. (Previously Presented) The purification device as defined in Claim 16, wherein the controller is further programmed to determine that the residual particulate matter in the filter has decreased to a level which does not damage the filter, when the exhaust gas has been maintained in a state corresponding to the lean air-fuel ratio for a predetermined time.

25. (Previously Presented) The purification device as defined in Claim 16, wherein the controller is further programmed to determine that the regeneration of the filter is required when the particulate matter trap amount is saturated, and determine that residual particulate matter in the filter has decreased to the level which does not damage the filter when the particulate matter trap amount is zero.

26. (Previously Presented) The purification device as defined in Claim 17, wherein the controller is further programmed to determine that the residual particulate matter in the filter has decreased to a level which does not damage the filter, when the controller started to generate the exhaust gas corresponding to the rich air-fuel ratio for the first time.

27. (Previously Presented) A purification device for an exhaust gas of a diesel engine, the diesel engine comprising a catalyst which traps nitrogen oxides in the exhaust gas but decreases a nitrogen oxides trapping performance when poisoned by sulfur oxides in the exhaust gas, and a filter which traps particulate matter in the exhaust gas, the device comprising:

means for determining if an elimination of the sulfur oxides poisoning the catalyst is required;

means for performing a process of eliminating the sulfur oxides poisoning the catalyst, when the elimination of the sulfur oxides poisoning the catalyst has been determined to be required;

means for determining if a regeneration of the filter is required while performing the process of eliminating the sulfur oxides;

means for performing the regeneration of the filter while interrupting the process of eliminating the sulfur oxides, when the regeneration of the filter has been determined to be required;

means for determining during the regeneration of the filter if a residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns; and

means for stopping the regeneration of the filter and resuming the process of eliminating the sulfur oxides poisoning the catalyst, when the residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns.

28. (Previously Presented) A purification method for an exhaust gas of a diesel engine, the diesel engine comprising a catalyst which traps nitrogen oxides in the exhaust gas but decreases a nitrogen oxides trapping performance when poisoned by sulfur oxides in the exhaust gas, and a filter which traps particulate matter in the exhaust gas, the method comprising:

determining if an elimination of the sulfur oxides poisoning the catalyst is required;

performing a process of eliminating the sulfur oxides poisoning the catalyst, when the elimination of the sulfur oxides poisoning the catalyst has been determined to be required;

determining if a regeneration of the filter is required while performing the process of eliminating of the sulfur oxides;

performing the regeneration of the filter while interrupting the process of eliminating the sulfur oxides, when the regeneration of the filter has been determined to be required;

determining during the regeneration of the filter if a residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns; and

stopping the regeneration of the filter and resuming the process of eliminating the sulfur oxides poisoning the catalyst, when the residual particulate matter in the filter has decreased to a level which does not damage the filter when the residual particulate matter in the filter burns.

29. (Previously Presented) The purification device as defined in Claim 15, wherein the diesel engine is used for driving a vehicle, and the controller is further programmed to determine that the elimination of the sulfur oxides poisoning the catalyst is required on the basis of at least one of a travel distance of the vehicle, a fuel consumption amount of the diesel engine, and a travel time of the vehicle, after the latest elimination of sulfur oxides poisoning.

10. EVIDENCE APPENDIX

None.

11. RELATED PROCEEDINGS APPENDIX

None.